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mal matter 11.6%; one stomach collected March 16, 1902, vegetable and animal matter each 50%; one stomach collected April 27, 1902, vegetable matter 6% and animal matter 94%. The food of the June specimens consisted of small oats, *Erodium*, grass seeds and Hymenoptera. Those taken in September had a more varied bill of fare, consisting of crickets, carabid beetles, ants, grasshoppers, Hymenoptera and one olive scale, chickweed, *Polygonum*, *Amaranthus*, *Erodium* and oats. Grasshoppers in the animal and wild oats in the vegetable food seem to largely predominate. One March stomach contained Hymenoptera and Hemiptera and unidentified seeds, while the April specimen showed Chrysomelid and

Lampyrid beetles, Jassids, Arachnids, oats and *Erodium*.

I believe the rufous-crowned sparrow to be resident in this locality, since I have collected them in September, November and March, and the abundance of food and mild winters would seem to suggest no necessity for migration. Despite the natural secretiveness of the species in breeding season I do not consider it wary at other seasons and its acquaintance may be easily cultivated. To my fancy the very solitude which this bird seeks makes it the more interesting to the ornithologist and I shall look forward to further investigation of its sage brush home with renewed interest.

The Redwood Belt of Northwestern California.

I. FAUNAL PECULIARITIES OF THE REGION.

BY WALTER K. FISHER.

THE northwest coast district of the United States is possessed of a peculiar interest ornithologically. It is a region of heavy rainfall and of dark forests, and not a few pale interior birds are here presented by more deeply colored races. For the student of geographical distribution it has also many attractions because such unusual conditions prevail. Combined with a long summer of comparatively low temperature for the latitude are frequent fogs and not a few rains. The proximity to the ocean has much to do with the equable climate, but the summer fogs and light rains more than anything perhaps are responsible for the temperature, since they greatly reduce the number of sunny days, and thus pull down very decidedly the sum total of heat for the season of reproduction. To the peculiar summer fogs and rain are also due the heavy forests and rank vegetation, and to both the fogs and forests the dark races of birds.

Without thinking one is prone to connect the intensity of coloring in the birds of this particular region directly with the heavy rainfall, as if the moisture itself in some manner acted to produce these deeper tints. In the same way the lack of rain in desert regions is sometimes invoked to explain the faded coloration of many of the desert-loving species. But, omitting the effect of the different rates of abrasion in humid and dry climate, the intensity of *color* itself seems more directly due to the proportion of cloudy days, irrespective of moisture, during the season of reproduction. With cloudy days is ranked also the semi-daylight of dark forests. Many of the humid belt birds spend their winters in the drier interior when the rainfall is heaviest in their breeding areas. They would therefore lose in a large degree any 'benefit' that the rain itself might confer, granting it possessed any sovereign influence. We must remember that the total rainfall of the Transition of the central Sierra Nevada exceeds that of Eureka in the so-called humid belt. But the rainstorms of the Sierra are very heavy, of short duration,

and rather scarce in summer. The number of sunny days each year is remarkably high. The quail, flicker, hairy woodpecker, Steller jay, white-crowned sparrow, creeper, and chickadee of the Sierra are either paler, or have more white in their plumage than their representatives in the coast belt. We might, for illustration, imagine a desert beset in summer with heavy fogs, *but having scarcely any rain*. Such a region would probably produce rather dark races of birds. On the other hand a fogless region of comparatively heavy rainfall of peculiar distribution, such as the Sierras, produces light races. It is reasonable to suppose—and tho we take it readily for granted it is not proved entirely—that the dark colors of the northwest coast birds have been assumed in response to protective natural selection. In other words a *dark* bird, or one with little white in its plumage is less conspicuous during the critical nesting period under sombre skies, or in a gloomy forest than a lighter bird, or a bird with considerable white in its plumage. Conversely, in the brilliant sunlight of the Sierra Nevada a lighter phase of this same species is less conspicuous than a dark form would be. The point to be emphasized of course is that moisture on the whole is only indirectly responsible for the dark races—and is indirectly responsible by its peculiar distribution in the form of fog and clouds thruout the summer.

In the following notes it is my object to record a few observations on the life zones and land birds* of the little-worked redwood belt, from Humboldt Bay to Crescent City, California. I landed at Eureka May 20, 1899 and spent a week in the vicinity of Arcata, at the end of Humboldt Bay. This is in the more open long ago lumbered district close to the coast. From June 8 to 21 I staid at a lumber camp north of Mad River close to a large tract of dense primeval forest. Then after spending a few days on the outer peninsula of Humboldt Bay I travelled up the coast by stage, stopping at Trinidad Head, the vicinity of which is lumbered off. One evening was spent at the mouth of the Klamath, and June 29 to July 8 at Crescent City, in the extreme northwest corner of the state.

The redwoods occupy a narrow belt next to the coast from the southwestern corner of Oregon (Chetco R.) to about twelve miles south of Punta Gorda, Monterey County. North of San Francisco Bay the belt is almost unbroken and assumes its greatest width in the country between Cape Mendocino and Humboldt Bay. From Humboldt Bay north the strip scarcely ever exceeds fifteen miles in width. The redwoods typically occupy the low hills and valleys next to the coast, and in the northern portion of their range probably never go over a thousand feet. In the vicinity of Humboldt Bay the belt ends abruptly at the first low range of mountains back of the coast.

It is a hazardous undertaking to define precisely the life zone of this strip, from Cape Mendocino north, for the simple reason that the belt is mixed zonally. There seems little doubt that south of Cape Mendocino the redwood belt is referable to the Humid Transition. Considerable confusion exists however as to the proper position of the coast belt north. Dr. Merriam, in 'Life Zones and Crop Zones,' places it as a division of his Canadian, but without remark. Other authors in an indefinite way have called the whole coast region boreal without differentiating the redwood belt from the quite different mountainous district just to the east of it. A little detail seems necessary in dealing with the subject.

But in a general way the open country immediately bordering the coast, the river valleys such as those of the Eel and Mad, and old deforested tracts, mostly near the coast and in or near the valley of the principal streams, contain species of birds and plants which would easily relegate these areas to the Humid Transition. The same is true of the mountains immediately to the east of the redwood

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belt, many of which rise to a height of several thousand feet. The narrow open coast belt extends up the coast to the Columbia, with a few interruptions. Near Crescent City it assumes the form of a Transition coastal plain several miles in width. Diagnostic plants of these Transition areas are:

<i>Acer macrophyllum</i>	<i>Populus trichocarpa</i>
<i>Arctostaphylos 'lomentosa'</i>	<i>Osmaronia cerasiformis</i>
<i>Azalea occidentalis</i>	<i>Pseudotsuga mucronata</i>
<i>Baccharis pilularis</i>	<i>Quercus densiflora</i>
<i>Brodiaea capitata</i>	<i>Rhododendron californicum (also boreal)</i>
<i>Castanopsis chrysophylla</i>	<i>Rhus diversiloba</i>
<i>Ceanothus thyrsiflorus</i>	<i>Ribes malvaceum (type)</i>
<i>Cornus nuttalli</i>	<i>Rhamnus purshiana</i>
<i>Corylus rostrata californica</i>	<i>Rubus ursinus</i>
<i>Fraxinus oregana</i>	<i>Scrophularia californica</i>
<i>Garrya elliptica</i>	<i>Vaccinium ovatum</i>
<i>Opulaster monogynus</i>	<i>Umbellularia californica (river valleys only)</i>
<i>Myrica californica</i>	
<i>Philadelphus [lewisi?]</i>	

In the mountains just to the east of the redwood belt, *Pseudotsuga mucronata* is the prevailing forest tree—a typical Transition species, as are also *Castanopsis chrysophylla*, *Quercus californica*, *Quercus densiflora*, *Quercus chrysolepis*, and *Arbutus menziesi*, which occurs here. Within about twenty-five miles of the coast in the latitude of Eureka, and fifteen in the latitude of Crescent City, the Humid Transition merges into the Arid Transition.

The extensive lumbering activities in the vicinity of Humboldt Bay have permanently laid bare large tracts of country. The original Canadian nature of such tracts has been completely changed, and several species of transition plants, originally inconspicuous or wanting in the cold adverse conditions of the forest floor, have taken a new lease on life. These, with the intrusion of other Austral types have actually changed the zone. The open country has been rapidly invaded by Austral birds. Such species are:

<i>Lophortyx californicus</i>	<i>Carpodacus m. frontalis</i>
<i>Zenaidura macroura</i>	<i>Carpodacus p. californicus</i>
<i>Cathartes aura</i>	<i>Astragalinus t. salicamans</i>
<i>Buteo b. calurus</i>	<i>Melospiza c. cleonensis</i>
<i>Falco sparverius</i>	<i>Spizella s. arizonæ</i>
<i>Chordeiles virginianus</i>	<i>Pipilo m. oregonus</i>
<i>Selasphorus alleni</i>	<i>Zamelodia melanocephala</i>
<i>Tyrannus verticalis</i>	<i>Cyanospiza amœna</i>
<i>Sayornis n. semiatra</i>	<i>Petrochelidon lunifrons</i>
<i>Empidonax difficilis</i>	<i>Tachycineta bicolor</i>
<i>Corvus americanus</i>	<i>Helminthophila c. lutescens</i>
<i>Agelaius g. californicus (?)</i>	<i>Dendroica aestiva</i>
<i>Sturnella m. neglecta</i>	<i>Chamæa f. phæa</i>
<i>Scolecophagus cyanocephalus</i>	<i>Sialia m. occidentalis</i>

These species, originally restricted to the narrow river valleys and open coast belt have since acquired a much wider distribution in this region. Many species have undoubtedly greatly increased in numbers since the advent of settlers, and possibly a few are recent intrusions.

The Canadian, in a weakened form is represented by a very restricted area, which, year by year is becoming smaller, and may ultimately disappear altogether.

I refer to the dark primeval redwood forests, especially those a short distance back from the coast, which occupy rather broad flattish valleys. Besides the redwoods which 'stand' remarkably heavy are large Sitka spruces (*Picea sitchensis*) western hemlocks (*Tsuga heterophylla*), Pacific cedar (*Thuja plicata*), and north of the Klamath the Lawson cypress (*Chamaecyparis lawsoniana*), all tending to produce a forest of Canadian-like qualities. It is only in favored places that the sun is able to penetrate the heavy foliage of these conifers, and among the cool depths of the forest we encounter real Canadian conditions. The redwood tree itself is not diagnostic, but the Sitka spruce, western hemlock and Pacific cedar while entering Transition—as we would expect from the nature of this zone—are all essentially Canadian trees, being common and characteristic in the Sitkan District. When fully developed they may be taken as marking the limits of the Canadian on the coast of northern California. Stunted groves occur sometimes in the coastal areas I have indicated as Transition, and occasionally in these groves we encounter tiny isolated Canadian islands. Not infrequently such groves were once in the interior of the redwood forest, which has long since been removed. The presence of a small percent Douglas spruces in the heavy forests indicates Transition qualities. In this area I found no boreal plants which are not almost equally characteristic of the cooler Humid Transition.

Acer circinatum

Achlys triphylla

Berberis aquifolia

Berberis nervosa

Galium boreale (local Crescent City)

Gaultheria shallon

Hippurus vulgaris

Lonicera involucrata

Ledum glandulosum (Crescent City)

Menziesia glabella

Oxalis oregana

Rubus parviflorus

Rubus spectabilis

Vaccinium parvifolium

Veratrum californicum

Whipplea modesta

Arctostaphylos uva-ursi is here purely maritime, as is *Pinus contorta*, and apparently, *Abies grandis*. It is not well to insist too strongly on their adequacy for tracing Canadian, tho they are all boreal types of great value.

Several birds emphasize the presence of the Boreal rather decidedly. These are *Bonasa umbellus sabinei* (also Transition), *Perisoreus obscurus*, *Merula m. propinqua* and *Ixoreus naevius*. Such birds as *Columba fasciata*, *Dryobates v. harrisi*, *Chætura vauxi*, *Contopus borealis*, *Cyanocitta s. carbonacea*, *Zonotrichia l. nuttalli*, *Olbiorchilus h. pacificus*, and *Certhia f. occidentalis*, tho ranging freely in to the Humid Transition are essentially Canadian in their nature—that is not Austral. Several distinctively boreal species of small mammals occur in the heavily forested belt. Perhaps none is more striking than the lemming-mouse (*Phenacomys albipes* Merriam).

To summarize. At present it seems that the Northwest Coast Boreal District, in California occupies only a very narrow and restricted belt in the form of dilute Canadian, south to the vicinity of Cape Mendocino. This belt comprises only the densest forests of redwood, Sitka spruce, western hemlock, Pacific cedar and Lawson cypress. All the other country including an open belt along the coast, the more open river valleys, mutilated districts, as well as the mountains immediately to the east of the redwoods belong to the Humid Transition. The Humid Transition still farther east merges into the Arid Transition or belt of the yellow and sugar pines.

(To be continued.)